

# Exploring NASA OMI Level 2 Data With Visualization

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## Quality Screening by Visualization

### Introduction

Satellite data products are important for a wide variety of applications that can bring far-reaching benefits to the science community and the broader society. These benefits can best be achieved if the satellite data are well utilized and interpreted, such as model inputs from satellite, or extreme events (such as volcano eruptions, dust storms, ... etc.).

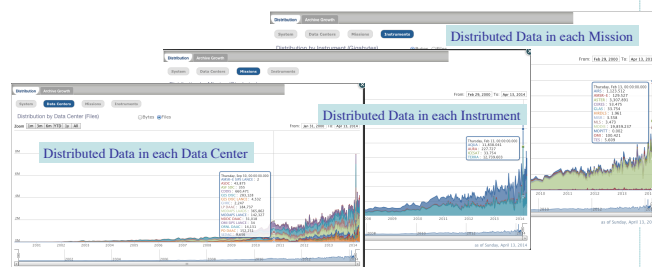
Unfortunately, this is not always the case, despite the abundance and relative maturity of numerous satellite data products provided by NASA and other organizations. Such obstacles may be avoided by allowing users to visualize satellite data as "images", with accurate pixel-level (Level-2) information, including pixel coverage area delineation and science team recommended quality screening for individual geophysical parameters.

We present a prototype service from the Goddard Earth Sciences Data and Information Services Center (GES DISC) supporting Aura OMI Level-2 Data with GIS-like capabilities. Functionality includes selecting data sources (e.g., multiple parameters under the same scene, like NO<sub>2</sub> and SO<sub>2</sub>, or the same parameter with different aggregation methods, like NO<sub>2</sub> in OMNO2G and OMNO2D products), user-defined area-of-interest and temporal extents, zooming, panning, overlaying, sliding, and data subsetting, reformatting, and reprojection.

The system will allow any user-defined portal interface (front-end) to connect to our back-end server with OGC standard-compliant Web Mapping Service (WMS) and Web Coverage Service (WCS) calls. This back-end service should greatly enhance its expandability to integrate additional outside data/map sources.

### Justification

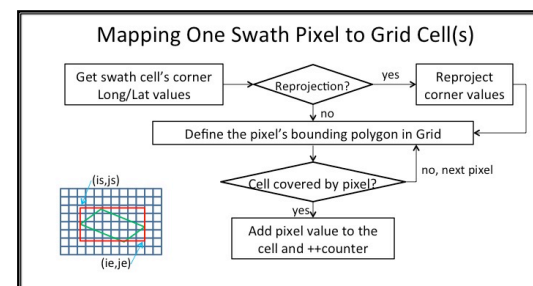
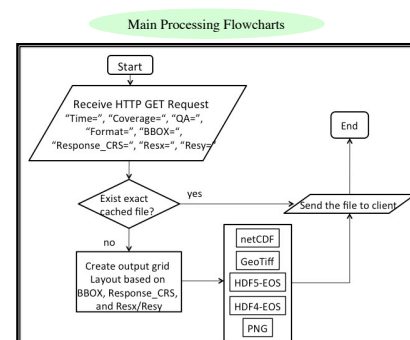
The Aura OMI data are among the most popular data archived at the GES DISC. The following tables show data usage and download statistics and provide a reason for developing this GIS-like high-resolution service.



Source: EOSDIS Watch Details, <https://earthdata.nasa.gov/about-eosdis/performance/eosdis-watch-details>

### GIS (Geospatial Information System) Infrastructure

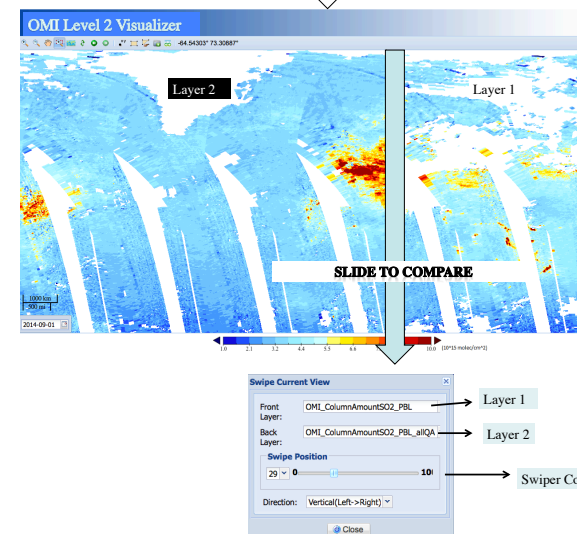
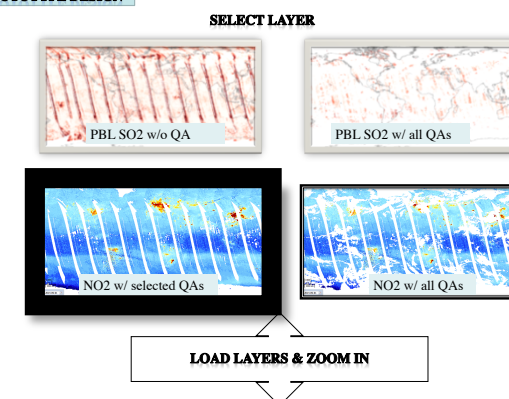
- OGC WCS-like compliant (User-defined Parameter from "Get Request")
- Level 2 original pixel shape/size to ground mapping
- Various combination of QA screen criteria
- Re-projection (e.g., WFR's Lambert Conical Equal Area, WGS84 Arctic/Antarctic Stereo, Lambert Azimuthal Equal Area)
- Spatial and temporal subsetting/stitching
- Multiple formats outputs (geoTiff, CF-netCDF, HDF4/5-EOS, PNG)
- User visualization and download portal



### GES DISC Implementation

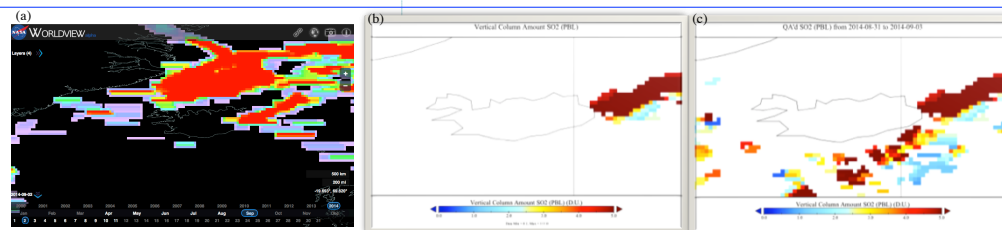
1. Help Science Team Users to visualize
  1. Identify unique scenes
  2. Quality screening criteria (Cloud fraction, RMS, Terrain, Solar Zenith Angle...)
  3. Different retrieval Algorithms
  4. Cross platform co-location (Inter-Comparison, Merging, Fusion, ...)
2. Help Research Community Users to understand via visualization
  1. Importance of Quality Flags by Science Team Recommendation
  2. Importance of Data Lineage (Original and Processed Data Files)
  3. Episodic Event Viewer (Spatial Scale Independent)
3. Extend OMI Level 2 Data to GIS Community

### PROTOTYPE DESIGN



### Inter-Comparison

Figure (left to right):  
(a) WorldView OMI SO<sub>2</sub> (PBL) on 2014-09-02.  
(b) Value-added QA'd SO<sub>2</sub> on 2014-09-02.  
(c) Composited QA'd SO<sub>2</sub> (2014-08-31 to 2014-09-03) [Bárðarbunga (Iceland) eruption occurred on 2014-08-11]



You may want to try our service. We welcome your comments/evaluation.  
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